REMARKS

This Request for Reconsideration is in response to the Office Action of November 1, 2004 in which claims 1, 2, 4, 5 and 7 were rejected and claims 3 and 6 objected to. Applicant would like to first say a few words about the features claimed in the independent claims before discussing the applied references and then the patentability of the claims over the references.

I. Subject matter of the claims

The application relates to a method of automatically tuning a loop-filter of a phase locked loop. The method comprises the following features:

A A loop-filter includes a capacitance at an output of a charge pump of a phase locked loop.

B The charge pump provides current impulses to the loop-filter.

C The amplitude of the current impulses output by the charge pump is adjusted

C.1 The adjustment is essentially proportionally to the capacitance at the output of the charge pump.

Steps C and C.1 allow a simple tuning of a loop-filter without a complicated calibration circuit. The invention is of particular advantage for an integrated loop-filter, in which the capacitance of capacitors is subject to changes. (page 1, line 27 to page 2, line 7 and page 3, lines 15-18)

The application comprises further an independent claim 4 directed at a corresponding phase locked loop and an independent claim 7 directed at a unit comprising such a phase locked loop.

II. Cited references

The examiner cites two documents for supporting his opinion that the independent claims are not new under Sections 102(e) and 102(b):

US 6,437,615 (Stascausky: §102(e))
Figure 2 presents a PLL including a charge pump 220 and a loop filter 230 comprising a capacitor.

Figure 5 presents a loop filter, which includes a current bypass circuit 510 for siphoning charge pump current away from a capacitor C1. (col. 8, lines 14-20)

By reducing the charge pump current flowing through the capacitor, the capacitance of the capacitor is effectively multiplied without the added expense and wasted surface area typically associated with increasing the size of the capacitor(s) to achieve the same results. (col. 9, lines 21-25)

US 6,326,852 (Wakayama: §102(b))
Figure 1 presents a PLL including a charge pump 12 and a loop filter 13. In Figure 5, the charge pump is shown in more detail (42-52). Also the loop filter is shown in more detail to comprise two capacitors (58, 60).

Maintaining perfect phase-lock VCO to data is difficult for conventional PLL circuits, because of the internal construction of conventional charge pump circuits. Fluctuations in the source and/or sink current waveforms are caused by a variety of factors, the majority of which are functions of the physical and electrical properties of semiconductor integrated circuit transistors and integrated circuit charge pumps manufactured therefrom. (col. 2, line 50 to col. 3, line 2)

It is an aim to minimize DC offsets at the output of a charge pump. (claim 1: col. 9, lines 5-6)

Referring to Figure 5, an amplifier 62 has a first input connected to a node defined between the resistor element and zero capacitor of the loop filter's RC network. A second input of the transconductance amplifier 62 is connected to a second output node defined by the common drain terminals of the second parallel conduction path of the charge pump. A dump capacitor 64 is coupled between the second input of the transconductance amplifier 62 and a reference potential in a manner similar to and consistent with the loop filter's zero capacitor 58 and the first input of the transconductance amplifier 62. Thus, the two inputs of the transconductance amplifier will be understood to be in static balance with respect to one another, given the appropriate design values for the dump capacitor 64 and zero capacitor 58.

III. Patentability

Independent claim 1

The examiner is of the opinion that either of the Stascausky reference and the Wakayama reference discloses the subject matter of claim 1.

Claim 1 aims at a compensation of undesired changes of the capacitance of a loop filter of a PLL. To this end, the amplitude of the current output by the charge pump is adjusted. (feature C of claim 1)

The adjustment is more specifically essentially proportional to the capacitance at the output of the charge pump. (feature C.1 of claim 1) That is, the higher the capacitance, the higher the amplitude of the current impulses. This allows ensuring that the response of the loop filter stays constant (page 3, 1st paragraph).

Stascausky: Features A and B might be considered to be disclosed by this document.

In contrast to claim 1, however, the Stascausky document aims at multiplying the capacitance of the loop filter without increasing the size of the capacitors.

The adjustment in the Stascausky document is moreover not essentially proportional to the capacitance at the output of the charge pump. (feature C.1 of claim 1) Rather, a current bypass and thus a decrease of the current through the capacitor(s) is to result in an increased capacitance.

Thus, object and solution in this document are different from claim 1.

Wakayama: Features A and B might be considered to be disclosed by this document.

In contrast to claim 1, however, the Wakayama document aims at avoiding fluctuations resulting from the properties of the charge pump, i.e., minimizing DC offsets at the output.

There is no indication in the Wakayama document that the amplitude of the current pulses output by the charge pump is adjusted. It is only indicated that DC offsets are minimized.

Further, there is no indication that the current is adjusted essentially proportionally to the capacitance at the output of the charge pump. (feature C.1 of claim 1) The structure of Figure 5 of the Wakayama document allows only evaluating differences between the voltage across capacitor 58 and capacitor 64. Actually, there is no indication that the capacitance at the output of the charge pump could change at all. The requirement of appropriate design values for the dump capacitor and the zero capacitor rather seem to imply that a stable, accurate capacitance is assumed, which can be achieved with external capacitors.

Thus, object and solution in this document are equally different from claim 1.

Independent claims 4 and 7

As the devices of claims 4 and 7 comprise features for realizing the steps of method claim 1, the same comments apply as for claim 1.

Regarding the dependent claims 2 and 5, these also recite the above-mentioned feature C.1, adding the further feature that the impulses are adjusted with a bias current to the charge pump. Neither of these features are shown or suggested by either of the applied references.

Withdrawal of the 35 USC §§102(b) and (e) rejections of claims 1, 2, 4, 5 and 7 is requested.

The indication of allowable subject matter in claims 3 and 6 is noted with appreciation, but it believed in light of the above discussion that the Examiner will be persuaded that all the pending claims 1-7 are new and non-obvious over the prior art.

The objections and rejections of the Office Action of November 1, 2004, having been obviated by amendment or shown to be inapplicable, withdrawal thereof is requested and passage of claims 1-7 to issue is earnestly solicited.

Respectfully submitted,

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